

# How can we calculate the costs of a firm?

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## Costs

### Short-run costs:

The *short run* is defined as a period in which the firm has decided its 'scale of plant' (capacity) and therefore can only increase output by increasing the use of that fixed capacity and by acquiring the use of additional variable factors of production, which is why in the short run firms have some fixed and some variable costs.

### *Total cost of production:*

- **Total cost = Fixed costs + Variable costs**
- **Average total cost** (or per unit cost, sometimes just called 'average cost') =  $\frac{\text{Total cost}}{\text{Output}}$

### *Fixed Costs:*

- Don't vary with output.
- Apply when at least one factor of production is fixed.
- Examples are rent, interest charges on borrowed capital, business rates and certain administration costs.
- They only apply in the short run – e.g. in the short run a supermarket has a fixed supply of land, however in the long run it may be able to buy land adjacent to the site, making the cost of land variable.
- **Average fixed costs** =  $\frac{\text{Total fixed cost}}{\text{Output}}$
- Fixed costs apply even if the firm stops production. Hence when the units of production produced are zero fixed cost is still there.

### *Variable Costs:*

- These costs vary with output.
- They occur both in the short and long run.
- E.g. a firm's electricity costs, wages, raw material costs, heating, lighting, power, fuel and transport costs because they rise when output rises (and fall as output falls).
- **Average variable costs** =  $\frac{\text{Total variable costs}}{\text{Output}}$

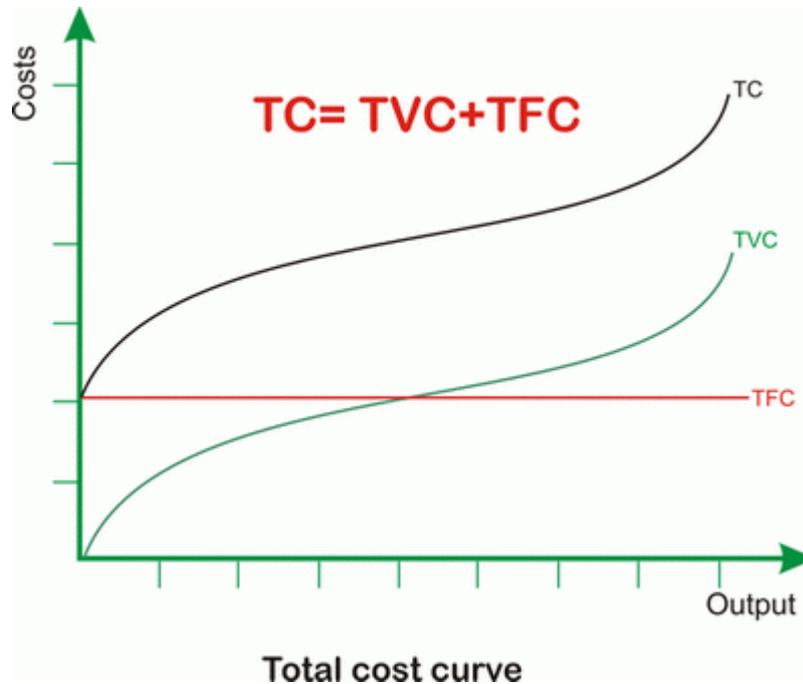
### *Marginal Costs:*

- Marginal cost is the change in total cost as a result of producing an additional unit of output.
- It is important to remember that even if marginal cost is falling total costs will still be rising as long as marginal costs are positive.
- **Marginal cost** =  $\frac{\text{change in total cost}}{\text{change in output}}$  or  $MC = \frac{\Delta TC}{\Delta Q}$
- **It can be found by subtracting each previous total cost from the new:  $TC_t - TC_{t-1}$**

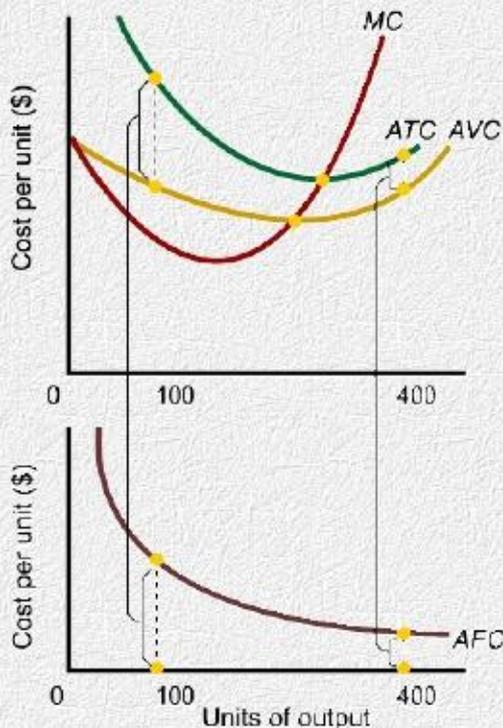
e.g.

Output	Total cost	Marginal cost
0	£100	-
1	£119	£19
2	£135	£16
3	£149	£14

*Shapes of the Cost Curves:*



## Relationship Between Average Total Cost and Marginal Cost



- If marginal cost is below average total cost, average total cost will decline toward marginal cost.
- If marginal cost is above average total cost, average total cost will increase.
- Marginal cost intersects average total cost and average variable cost curves at their minimum points.

## Points to remember:

- The marginal cost always goes through the minimum point of the average variable cost and average total cost curves.
- If marginal cost is less than average cost, AC is falling because the average is being pulled down. Similarly, if MC is greater than AC, it is rising.
- The gap between the average total and average variable cost curve is always diminishing (getting smaller) because the average fixed cost is always getting smaller. In addition, beyond the lowest points of the ATC and AVC curves the firm begins to experience diminishing returns to a fixed factor and, therefore, as additional factors of production are added to a fixed factor, they start to overcrowd each other and the ATC and AVC start to increase.
- The average total cost and average variable costs slope downwards originally because of increasing returns to a fixed factor – as greater inputs are added to a fixed factor such as a shop or factory floor, the firm will increase output at a faster rate and therefore average costs will fall.

### Tabular Representation of Costs:

Units			\$						
Capital	Labour	product (output)	Total cost			Average Cost			Marginal Cost
			TVC	TFC	TC	AVC	AFC	AC	MC
10	0	0	0	1000	1000	0			
10	1	20	200	1000	1200	10	50	60	10
10	2	54	400	1000	1400	7.4	18.5	25.9	5.9
10	3	100	600	1000	1600	6	10	16	4.3
10	4	151	800	1000	1800	5.3	6.6	11.9	3.9
10	5	197	1000	1000	2000	5.1	5.1	10.2	4.3
10	6	230	1200	1000	2200	5.2	4.3	9.6	6.1
10	7	251	1400	1000	2400	5.6	4	9.6	9.5
10	8	260	1600	1000	2600	6.2	3.8	10	22.2

1. Assuming that capital C0515 5100 per unit and labour C051S \$200 per unit.

2. The three measures Of average costs have been culated to the nearest decimal from total figures.

### Optimum factor combination:

- This is the best combination of fixed and variable costs.
- E.g:

Number of Workers	Fixed Factor land	Total Output	Average Return of Labour (output/no. workers)
1	1	5	5.0
2	1	15	7.5
3	1	27	9.0
4	1	32	8.0
5	1	36	7.2
6	1	38	6.3
7	1	38	5.4

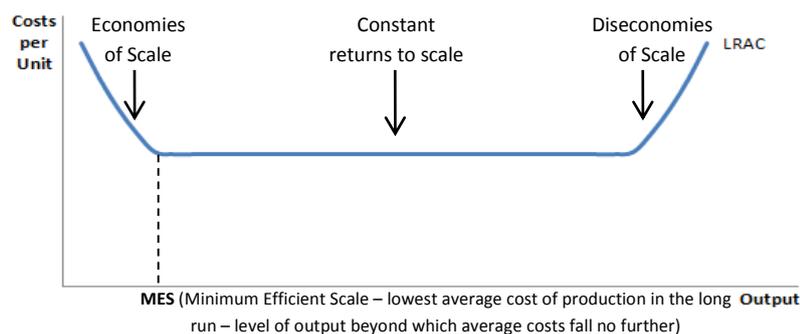
- In this case the optimum factor combination is the point where there is maximum output per worker, which is where there are 3 workers.
- This is where the return of labour is highest.
- This means that the optimum factor combination is 1:3 (fixed costs to variable costs).

### Long run costs:

The *long run* is defined as a period when the enterprise can alter its scale of plant (expand or contract size). All factors of production therefore become variable. It is likely that, as the scale of plant increases, the firm may enjoy the benefits of internal economies of scale. Where these are achieved, the average total cost in the long run (LRAC) is likely to fall.

### Economies and diseconomies of scale

#### Economies of Scale:



- Larger firms will experience significant cost advantages
- Firm is able to exploit their increased size and lower long-run average cost (LRAC)
- By driving down the LRAC and approaching the minimum point on the LRAC curve, the firm is moving closer to productive efficiency
- It also means that firms can achieve greater supernormal profits

Types of economies of scale are:

**Technical economies** – increases in productivity:

- *Specialisation* – the bigger the firm, the greater the opportunities for specialisation – specialist machinery will allow the firm to increase capital and labour productivity (total factor productivity) thus lowering long run average costs.
- *Indivisibilities* – increased productivity by using more efficient capital – capital equipment with high levels of productivity is often large and expensive and is indivisible in the sense that it is not available in a smaller version – only when a firm's output grows will it be able to afford to use these large pieces of capital equipment – at low levels of output these indivisible units of capital equipment would be under-utilised and the firm would be operating with excess capacity.
- *Linkage of processes (multiples)* – if the first machine in a process has a capacity of 20 units/hour and the second has a capacity of 15/hour they will require an output of at least 60 units/hour to use all its machinery to its full capacity (with three of the first machine and four of the second) and maximise productivity – if only 40 units per hour are being made then the second machine is being under-utilised.

**Marketing economies:**

- Large firms are powerful enough to buy raw materials and other inputs at a discount – they can threaten to take their business elsewhere.
- Can use their own lorry fleets and bulk containers to transport goods to markets – cost per unit transported falls.
- Large firms are able to buy discounted advertising space in newspapers and magazines and time on TV and radio.
- Larger brand recognition and more sales outlets lead to increased sales.

**Financial economies:**

- Large firms can obtain finance more cheaply and easily – generally have a higher credit rating.
- Considered lower risk than smaller firms – more established reputation and can offer more collateral security.
- Can obtain more favourable repayment terms and lower rates of interest than smaller firms – lowers costs per unit.

**Managerial economies:**

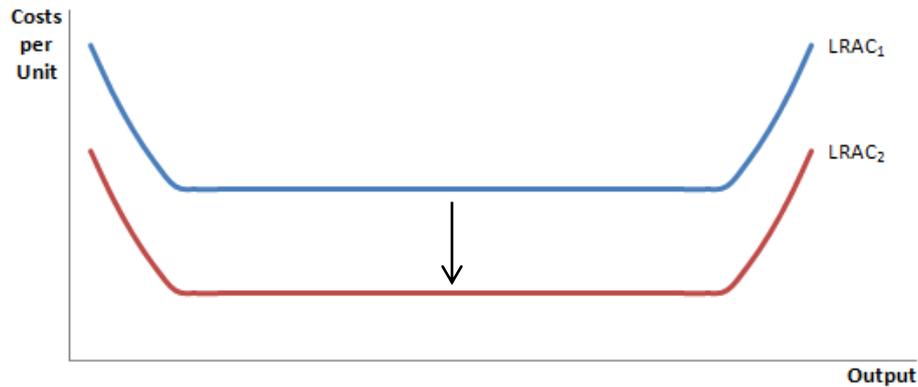
- Larger firms can employ specialist managers and departments.
- This expertise means that efficiency can increase, leading to higher productivity and lower costs per unit.

**Economies of scope:**

- Mergers and expansion can lead to a greater range of goods being produced.
- When a firm increases the variety of goods it produces, LRACs can fall.
- This is because as the firm's management structure, design, marketing, administrative systems and distribution costs are spread over such a large product range the AC for each product decreases.

### *External economies of scale:*

- The above economies of scale only deal with internal changes.
- Changes within the whole industry can affect all firms within the industry, regardless of size e.g. a technological breakthrough.
- In addition the geographical concentration of an industry means that the local labour force is geared up for the skill requirements of the industry – local colleges often run courses geared to employment in the industry and there are specialist support firms – this benefits all firms by providing a skilled workforce.



### **Diseconomies of Scale:**

- Large firms can eventually become more difficult to manage.
- There may be problems organising and coordinating the firm's activities.
- There may be slow and ineffective decision making and poor communication.
- These result mainly from the managerial side of the business, leading to the firm splitting itself into separate operating divisions or even demerging.

### *External diseconomies of scale:*

- If too many firms concentrate into an area then local labour can become scarce, and higher wages have to be offered to attract new workers.
- Land and factory space can become scarce, meaning that rents begin to rise.
- Local roads become congested so transport costs begin to rise.
- If the whole industry goes into decline as a result of falling demand the region will suffer high structural unemployment e.g. in the Lancashire textiles industry and the shipyards on the Tyne and the Clyde where cheaper imports made it impossible for UK firms to compete.